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Characterization and digitization of the early fissures in argillaceous micritic limestone and their relation with sandy dykes

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The purpose of this study is to determine the chronology of early phases of fissuring inside an argillaceous rock from a sample taken from Bevons in south-eastern France, which dates from the Aptian-Albian era. This geological formation, composed of marls and limestone interstratified, has been recut by a sedimentary sills and "per descensum" dykes of sandstone. They have recorded an early fracturing, occurred during the diagenesis of the sedimentary sequence.

The sample, a rectangular prism with a length of 18.5 cm and a width of 5.6 cm, is essentially composed of micritic limestone and small channels of clastic dykes. Our aim is to focus on the geometry and spatial distribution of fissures, from a centimetric to a micrometric scale, and on the content of the fissures network. This, in order to ascertain the chronology of the deformations and to establish whether or not a relationship exists with the occurrence of the sandy injections. Different sections where observed with the SEM (scanning electron microscope) and a cartography done by EDS (energy dispersion spectrometry) was examined.

To prepare a 3D reconstruction of the network of fissures, the sample was cut into 14 sections each with an average thickness of 3mm. The digitization, using Gocad 2002 software, allowed us to simulate the fissures to create a numerical model with triangular surfaces of discontinuities. Using stereographic projection of the average normal vectors of these surfaces, it was possible to differentiate various families of fissures and put them in chronological order.